Application Accelerator for VMware Tanzu

Application Accelerator for VMware Tanzu 1.1

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Contents

Application Accelerator for VMware Tanzu v1.1

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This chapter includes the following topics:

Application Accelerator overview

Application Accelerator for VMware Tanzu helps you bootstrap developing your applications and deploying them in a discoverable and repeatable way.

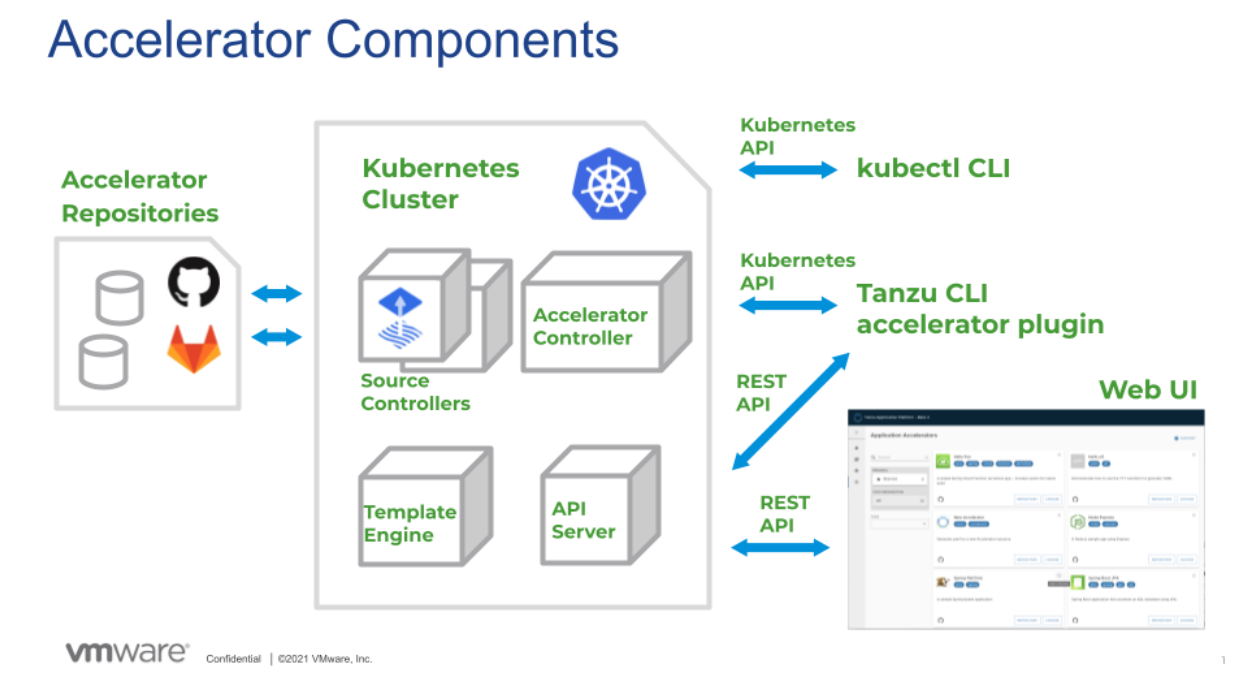
Enterprise Architects author and publish accelerator projects that provide developers and operators in their organization ready-made, enterprise-conformant code and configurations.

Published accelerators projects are maintained in Git repositories. You can then use Application Accelerator to create new projects based on those accelerator projects.

The Application Accelerator user interface(UI) enables you to discover available accelerators, configure them, and generate new projects to download.

Architecture

The following diagram illustrates the Application Accelerator architecture.



How does Application Accelerator work?

Application Accelerator allows you to generate new projects from files in Git repositories. An **`accelerator.yaml`** file in the repository declares input options for the accelerator. This file also contains instructions for processing the files when you generate a new project.

Accelerator custom resources (CRs) control which repositories appear in the Application Accelerator UI. You can maintain CRs by using Kubernetes tools such as kubectl or by using the Tanzu CLI accelerator commands. The Accelerator controller reconciles the CRs with a Flux2 Source Controller to fetch files from GitHub or GitLab.

The Application Accelerator UI gives you a searchable list of accelerators to choose from. After you select an accelerator, the UI presents input fields for any input options.

Application Accelerator sends the input values to the Accelerator Engine for processing. The Engine then returns the project in a ZIP file. You can open the project in your favorite integrated development environment(IDE) to develop further.

Next steps

Learn more about:

- Chapter 4 Creating accelerators

Application Accelerator release notes

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This chapter includes the following topics:

v1.1

Release Date: April 12, 2022

> **Note:** Application Accelerator release notes are now included in the Tanzu Application Platform Release notes.

Installing Application Accelerator for Tanzu Application Platform

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Application Accelerator is a component of VMware Tanzu Application Platform. For information about installing Tanzu Application Platform, see the Tanzu Application Platform documentation.

You can navigate to and interact with the available Accelerator resources using |Tanzu Application Platform GUI.

This chapter includes the following topics:

Uninstalling Application Accelerator for Tanzu Application Platform

Application Accelerator is a component of Tanzu Application Platform. To uninstall Tanzu Application Platform, see the Tanzu Application Platform documentation.

Creating accelerators

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This topic describes how to create an accelerator in Tanzu Application Platform GUI. An accelerator contains your enterprise-conformant code and configurations that developers can use to create new projects that by default follow the standards defined in your accelerators.

This chapter includes the following topics:

Prerequisites

The following prerequisites are required to create an accelerator:

- Application Accelerator is installed. For information about installing Application Accelerator, see Chapter 3 Installing Application Accelerator for Tanzu Application Platform
- You can access Tanzu Application Platform GUI from a browser. For more information, see the "Tanzu Application Platform GUI" section in the most recent release for Tanzu Application Platform documentation
- kubectl v1.20 and later. The Kubernetes command line tool (kubectl) is installed and authenticated with admin rights for your target cluster.

Getting started

You can use any Git repository to create an accelerator. You need the URL for the repository to create an accelerator.

For this example, the Git repository is **`public`** and contains a **`README.md`** file. These are options available when you create repositories on GitHub.

Use the following procedure to create an accelerator based on this Git repository:

1 Clone your Git repository.

2 Create a file named **`accelerator.yaml`** in the root directory of this Git repository.

3 Add the following content to the **`accelerator.yaml`** file:

```
accelerator:
  displayName: Simple Accelerator
  description: Contains just a README
  iconUrl: https://images.freecreatives.com/wp-content/uploads/2015/05/
smiley-559124_640.jpg
  tags:
  - simple
  - getting-started
```

Feel free to use a different icon if it uses a reachable URL.

4 Add the new **`accelerator.yaml`** file, commit this change, and push to your Git repository.

Publishing the new accelerator

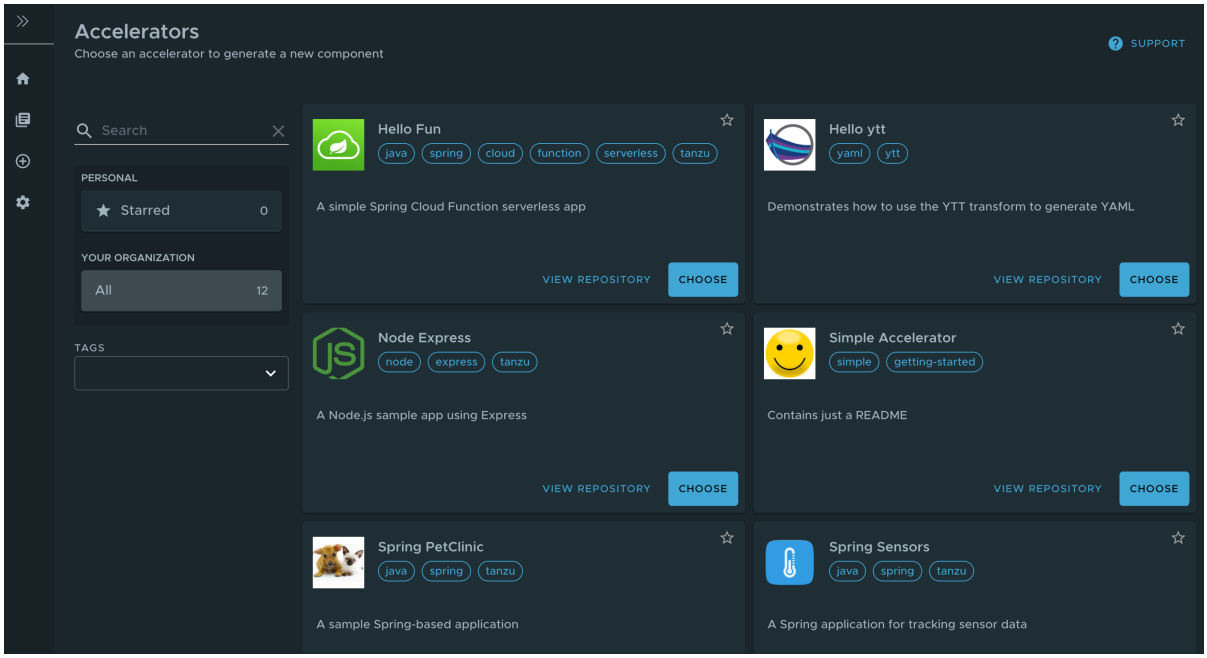
1 To publish your new accelerator, run this command in your terminal:

```
tanzu acc create simple --git-repository YOUR-GIT-REPOSITORY-URL --git-branch YOUR-GIT-
BRANCH
```

Where:

- **`YOUR-GIT-REPOSITORY-URL`** is the URL for your Git repository.
- **`YOUR-GIT-BRANCH`** is the name of the branch where you pushed the new **`accelerator.yaml`** file.

2 Refresh Tanzu Application Platform GUI to reveal the newly published accelerator.



Note: It might take a few seconds for Tanzu Application Platform GUI to refresh the catalog and add an entry for your new accelerator.

An alternative to using the Tanzu CLI is to create a separate manifest file and apply it to the cluster:

1 Create a **`simple-manifest.yaml`** file and add the following content, filling in with your Git repository and branch values.

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: simple
  namespace: accelerator-system
spec:
  git:
    url: YOUR-GIT-REPOSITORY-URL
    ref:
      branch: YOUR-GIT-BRANCH
```

2 To apply the **`simple-manifest.yaml`**, run this command in your terminal in the directory where you created this file:

```
kubectl apply -f simple-manifest.yaml
```

Next steps

Learn how to:

- Write an Creating an accelerator.yaml file.
- Configure accelerators with Accelerator custom resource definition.

- Manipulate files using Introduction to transforms.
- Use SpEL samples.

Creating an accelerator.yaml file

This topic describes how to create an accelerator.yaml file. By including an **`accelerator.yaml`** file in your Accelerator repository, you can declare input options that users fill in using a form in the UI. Those option values control processing by the template engine before it returns the zipped output files. For more information, see the Sample accelerator.

When there is no **`accelerator.yaml`**, the repository still works as an accelerator but the files are passed unmodified to users.

`accelerator.yaml` has two top-level sections: **`accelerator`** and **`engine`**.

Accelerator

This section documents how an accelerator is presented to users in the web UI. For example:

```
accelerator:
  displayName: Hello Fun
  description: A simple Spring Cloud Function serverless app
  iconUrl: https://raw.githubusercontent.com/simple-starters/icons/master/icon-cloud.png
  tags:
  - java
  - spring

  options:
  - name: deploymentType
    inputType: select
    choices:
    - value: none
      text: Skip Kubernetes deployment
    - value: k8s-simple
      text: Kubernetes deployment and service
    - value: knative
      text: Knative service
    defaultValue: k8s-simple
    required: true
```

Accelerator metadata

These properties are in accelerator listings such as the web UI:

- **displayName**: A human-readable name.
- **description**: A more detailed description.
- **iconUrl**: A URL pointing to an icon image.
- **tags**: A list of tags used to filter accelerators.

Accelerator options

The list of options is passed to the UI to create input fields for each option.

The following option properties are used by both the UI and the engine.

- **name**:Each option must have a unique, camelCase name. The option value entered by a user is made available as a SpEL samples variable name. For example, `#deploymentType`.
- **dataType**:Data types that work with the UI are `string`, `boolean`, `number`, and arrays of those, as in `[string]`, `[number]`, and so on. Most input types return a string, which is the default. Use Boolean values with `checkbox`.
- **defaultValue**:This literal value pre-populates the option. Ensure its type matches the dataType. For example, use `["text 1", "text 2"]` for the dataType `[string]`. Options without a `defaultValue` can trigger a processing error if the user doesn't provide a value for that option.
- **validationRegex**: When present, a regex validates the string representation of the option value *when set*. It doesn't apply when the value is blank. As a consequence, don't use the regex to enforce a requirement. See **required** for that purpose.

  This regex can be used by several layers in Application Accelerator, built using several technologies, for example, JavaScript and Java. So refrain from using "exotic" regex features. Also, the regex applies to portions of the value by default. That is, `[a-z ]+` matches `Hello world` despite the capital `H`. To apply it to the whole value (or just start/end), anchor it using `^` and `$`.

  Finally, backslashes in a YAML string using double quotes must be escaped, so to match a number, write `validationRegex: "\d+"` or use another string style.

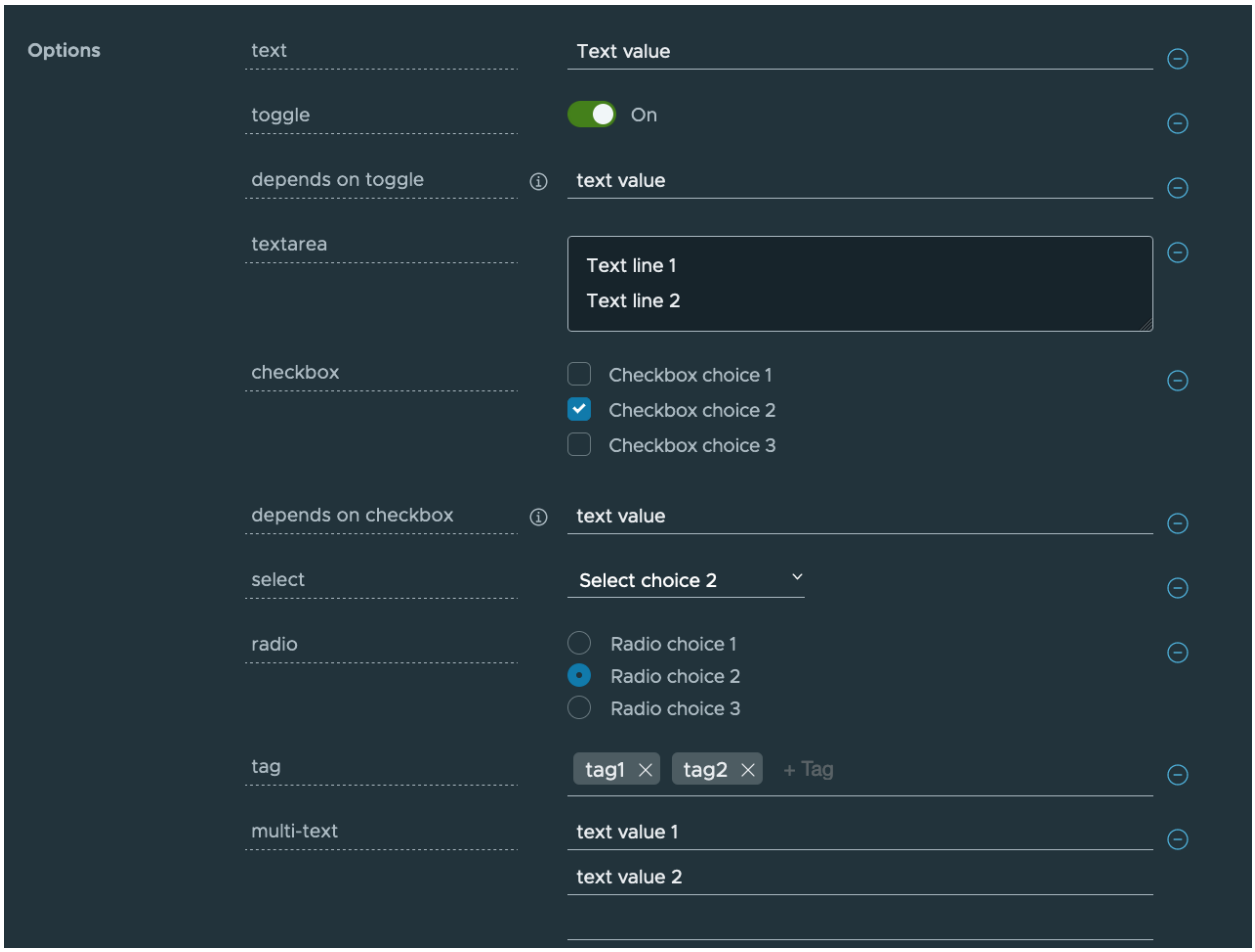
The following option properties are for UI purposes only.

- **label**: A human-readable version of the `name` identifying the option.
- **description**: A tooltip to accompany the input.
- **inputType**:
  - `text`: The default input type.
  - `textarea`: Single text value with larger input that allows line breaks.
  - `checkbox`: Ideal for Boolean values or multivalue selection from choices.
  - `select`: Single-value selection from choices using a drop-down menu.
  - `radio`: Alternative single-value selection from choices using buttons.
- **choices**:This is a list of predefined choices. Users can select from the list in the UI. Choices are supported by `checkbox`, `select`, and `radio`. Each choice must have a `text` property for the displayed text, and a `value` property for the value that the form returns for that choice. The list is presented in the UI in the same order as it is declared in `accelerator.yaml`.
- **required**: `true` forces users to enter a value in the UI.

- **dependsOn**:This is a way to control visibility by specifying the `name` and optional `value` of another input option. When the other option has a matching value, or any value if no `value` is specified, then the option with `dependsOn` is visible. Otherwise, it is hidden. Ensure the value matches the dataType of the `dependsOn` option. For example, a multivalue option such as a `checkbox` uses `[matched-value]`.

Examples

The screenshot and `accelerator.yaml` file snippet that follows demonstrates each `inputType`. You can also see the sample demo-input-types on GitHub.




```
accelerator:
  displayName: Demo Input Types
  description: "Accelerator with options for each inputType"
  iconUrl: https://raw.githubusercontent.com/sample-accelerators/icons/master/icon-tanzu-
light.png
  tags: ["demo", "options"]

  options:

  - name: text
    display: true
    defaultValue: Text value
```

```
- name: toggle
  display: true
  dataType: boolean
  defaultValue: true

- name: dependsOnToggle
  label: 'depends on toggle'
  description: Visibility depends on the value of the toggle option being true.
  dependsOn:
    name: toggle
  defaultValue: text value

- name: textarea
  inputType: textarea
  display: true
  defaultValue: |
    Text line 1
    Text line 2

- name: checkbox
  inputType: checkbox
  display: true
  dataType: [string]
  defaultValue:
    - value-2
  choices:
    - text: Checkbox choice 1
      value: value-1
    - text: Checkbox choice 2
      value: value-2
    - text: Checkbox choice 3
      value: value-3

- name: dependsOnCheckbox
  label: 'depends on checkbox'
  description: Visibility depends on the checkbox option containing a checked value value-2.
  dependsOn:
    name: checkbox
    value: [value-2]
  defaultValue: text value

- name: select
  inputType: select
  display: true
  defaultValue: value-2
  choices:
    - text: Select choice 1
      value: value-1
    - text: Select choice 2
      value: value-2
    - text: Select choice 3
      value: value-3

- name: radio
```

```
    inputType: radio
    display: true
    defaultValue: value-2
    choices:
      - text: Radio choice 1
        value: value-1
      - text: Radio choice 2
        value: value-2
      - text: Radio choice 3
        value: value-3

engine:
  type: YTT
```

Engine

The engine section describes how to take the files from the accelerator root directory and transform them into the contents of a generated project file.

The YAML notation here defines what is called a transform. A transform is a function on a set of files. It uses a set of files as input. It produces a modified set of files as output derived from this input.

Different types of transforms do different tasks:

- Filtering the set of files: that is, removing or keeping files that match certain criteria.
- Changing the contents of files. For example, replacing some strings in the files.
- Renaming or moving files: that is, changing the paths of the files.

The notation also provides the composition operators **`merge`** and **`chain`**, which enable you to create more complex transforms by composing simpler transforms together.

The following is an example of what is possible. To learn the notation, see Introduction to transforms.

Engine example

```
engine:
  include:
    ["**/*.md", "**/*.xml", "**/*.gradle", "**/*.java"]
  exclude:
    ["**/secret/**"]
  let:
    - name: includePoms
      expression:
        "#buildType == 'Maven'"
    - name: includeGradle
      expression: "#buildType == 'Gradle'"
  merge:
    - condition:
        "#includeGradle"
      include: ["*.gradle"]
    - condition: "#includePoms"
```

```
      include: ["pom.xml"]
    - include: ["**/*.java", "README.md"]
      chain:
        - type: ReplaceText
          substitutions:
            - text: "Hello World!"
              with: "#greeting"
  chain:
    - type: RewritePath
      regex: (.*)simpleboot(.*)
      rewriteTo: "#g1 + #packageName + #g2"
    - type: ReplaceText
      substitutions:
        - text: simpleboot
          with: "#packageName"
  onConflict:
    Fail
```

Engine notation descriptions

This section describes the notations in the preceding example.

`engine` is the global transformation node. It produces the final set of files to be zipped and returned from the accelerator. As input, it receives all the files from the accelerator repository root. The properties in this node dictate how this set of files is transformed into a final set of files zipped as the accelerator result.

`engine.include` filters the set of files, retaining only those matching a list of path patterns. This ensures that that the accelerator only detects files in the repository that match the list of patterns.

`engine.exclude` further restricts which files are detected. The example ensures files in any directory called **`secret`** are never detected.

`engine.let` defines additional variables and assigns them values. These derived symbols function such as options, but instead of being supplied from a UI widget, they are computed by the accelerator itself.

`engine.merge` executes each of its children in parallel. Each child receives a copy of the current set of input files. These are files remaining after applying the **`include`** and **`exclude`** filters. Each of the children therefore produces a set of files. All the files from all the children are then combined, as if overlaid on top of each other in the same directory. If more than one child produces a file with the same path, the transform resolves the conflict by dropping the file contents from the earlier child and keeping the contents from the later child.

`engine.merge.chain` specifies additional transformations to apply to the set of files produced by this child. In the example, **`ReplaceText`** is only applied to Java files and **`README.md`**.

`engine.chain` applies transformation to all files globally. The chain has a list of child transformations. These transformations are applied after everything else in the same node. This is the global node. The children in a chain are applied sequentially.

engine.onConflict specifies how conflict is handled when an operation, such as merging, produces multiple files at the same path: - **Fail** raises an error when there is a conflict. - **UseFirst** keeps the contents of the first file. - **UseLast** keeps the contents of the last file. - **Append** keeps both by using **cat <first-file> <second-file>**.

Introduction to transforms

When the accelerator engine executes the accelerator, it produces a ZIP file containing a set of files. The purpose of the **engine** section is to describe precisely how the contents of that ZIP file is created.

```
accelerator:
  ...
engine:
  <transform-definition>
```

Why transforms?

When you run an accelerator, the contents of the accelerator produce the result. It is made up of subsets of the files taken from the accelerator **<root>** directory and its subdirectories. You can copy the files as is, or transform them in a number of ways before adding them to the result.

As such, the YAML notation in the **engine** section defines a transformation that takes as input a set of files (in the **<root>** directory of the accelerator) and produces as output another set of files, which are put into the ZIP file.

Every transform has a **type**. Different types of transform have different behaviors and different YAML properties that control precisely what they do.

In the following example, a transform of type **Include** is a filter. It takes as input a set of files and produces as output a subset of those files, retaining only those files whose path matches any one of a list of **patterns**.

If the accelerator has something like this:

```
engine:
  type: Include
  patterns: ['**/*.java']
```

This accelerator produces a ZIP file containing all the **.java** files from the accelerator **<root>** or its subdirectories but nothing else.

Transforms can also operate on the contents of a file, instead of merely selecting it for inclusion.

For example:

```
type: ReplaceText
substitutions:
- text: hello-fun
  with: "#artifactId"
```

This transform looks for all instances of a string **`hello-fun`** in all its input files and replaces them with an **`artifactId`**, which is the result of evaluating a SpEL expression.

Combining transforms

From the preceding examples, you can see that transforms such as **`ReplaceText`** and **`Include`** are too "primitive" to be useful by themselves. They are meant to be the building blocks of more complex accelerators.

To combine transforms, provide two operators called **`Chain`** and **`Merge`**. These operators are recursive in the sense that they compose a number of child transforms to create a more complex transform. This allows building arbitrarily deep and complex trees of nested transform definitions.

The following example shows what each of these two operators does and how they are used together.

Chain

Because transforms are functions whose input and output are of the same type (a set of files), you can take the output of one function and feed it as input to another. This is what **`Chain`** does. In mathematical terms, **`Chain`** is *function composition*.

You might, for example, want to do this with the **`ReplaceText`** transform. Used by itself, it replaces text strings in *all* the accelerator input files. What if you wanted to apply this replacement to only a subset of the files? You can use an **`Include`** filter to select only a subset of files of interest and chain that subset into **`ReplaceText`**.

For example:

```
type: Chain
transformations:
- type: Include
  patterns: ['**/pom.xml']
- type: ReplaceText
  substitutions:
  - text: hello-fun
    with: "#artifactId"
```

Merge

Chaining **`Include`** into **`ReplaceText`** limits the scope of **`ReplaceText`** to a subset of the input files. Unfortunately, it also eliminates all other files from the result.

For example:

```
engine:
  type: Chain
  transformations:
  - type: Include
    patterns: ['**/pom.xml']
  - type: ReplaceText
    substitutions:
```

```
    - text: hello-fun
      with: "#artifactId"
```

The preceding accelerator produces a ZIP file that only contains **`pom.xml`** files and nothing else.

What if you also wanted other files in that ZIP? Perhaps you want to include some Java files as well, but don't want to apply the same text replacement to them.

You might be tempted to write something such as:

```
engine:
  type: Chain
  transformations:
  - type: Include
    patterns: ['**/pom.xml']
  - type: ReplaceText
    ...
  - type: Include
    patterns: ['**/*.java']
```

However, that doesn't work. If you chain non-overlapping includes together like this, the result is an empty result set. The reason is that the first include retains only **`pom.xml`** files. These files are fed to the next transform in the chain. The second include only retains **`.java`** files, but because there are only **`pom.xml`** files left in the input, the result is an empty set.

This is where **`Merge`** comes in. A **`Merge`** takes the outputs of several transforms executed independently on the same input sourceset and combines or merges them together into a single sourceset.

For example:

```
engine:
  type: Merge
  sources:
  - type: Chain
    - type: Include
      patterns: ['**/pom.xml']
    - type: ReplaceText
      ...
  - type: Include
    patterns: ['**/*.java']
```

The preceding accelerator produces a result that includes both:

- The **`pom.xml`** files with some text replacements applied to them.
- Verbatim copies of all the **`.java`** files.

Shortened notation

It becomes cumbersome and verbose to combine transforms such as **`Include`**, **`Exclude`**, and **`ReplaceText`** with explicit **`Chain`** and **`Merge`** operators. Also, there is a common composition pattern to using them. Specifically, select an interesting subset using includes/excludes, apply a chain of additional transformations to the subset, and merge the result with the results of other transforms.

That is why there is a swiss army knife transform (known the **`Combo`** transform) that combines **`Include`**, **`Exclude`**, **`Merge`**, and **`Chain`**.

For example:

```
type: Combo
include: ['**/*.txt', '**/*.md']
exclude: ['**/secret/*']
merge:
- <transform-definition>
- ...
chain:
- <transform-definition>
- ...
```

Each of the properties in this **`Combo`** transform is optional if you specify at least one.

Notice how each of the properties **`include`**, **`exclude`**, **`merge`**, and **`chain`** corresponds to the name of a type of transform, only spelled with lowercase letters.

If you specify only one of the properties, the **`Combo`** transform behaves exactly as if you used that type of transformation by itself.

For example:

```
merge: ...
```

Behaves the same as:

```
type: Merge
sources: ...
```

When you do specify multiple properties at the same time, the **`Combo`** transform composes them together in a "logical way" combining **`Merge`** and **`Chain`** under the hood.

For example:

```
include: ['**/*.txt', '**.md']
chain:
- type: ReplaceText
  ...
```

Is the same as:

```
type: Chain
transformations:
```

```
- type: Include
  patterns: ['**/*.txt', '**.md']
- type: Chain
  trasformations:
  - type: ReplaceText
    ...
```

When you use all of the properties of `Combo` at once:

```
include: I
exclude: E
merge:
- S1
- S2
chain:
- T1
- T2
```

This is equivalent to:

```
type: Chain
transformations:
- type: Include
  patterns: I
- type: Exclude
  patterns: E
- type: Merge
  sources:
  - S1
  - S2
- T1
- T2
```

A Combo of one?

You can use the `Combo` as a convenient shorthand for a single type of annotation. However, though you *can* use it to combine multiple types, and though that is its main purpose, that doesn't mean you *have* to.

For example:

```
include: ["**/*.java"]
```

This is a `Combo` transform (remember, `type: Combo` is optional), but rather than combining multiple types of transforms, it only defines the `include` property. This makes it behaves exactly as an `Include` transform:

```
type: Include
patterns: ["**/*.java"]
```

It is usually more convenient to use a **`Combo`** transform to denote a single **`Include`**, **`Exclude`**, **`Chain`**, or **`Merge`** transform, because it is slightly shorter to write it as a **`Combo`** than writing it with an explicit **`type:`** property.

A common pattern with merge transforms

It is a common and useful pattern to use merges with overlapping contents to apply a transformation to a subset of files and then replace these changed files within a bigger context.

For example:

```
engine:
  merge:
  - include: ["**/*"]
  - include: ["**/pom.xml"]
    chain:
    - type: ReplaceText
        subsitutions: ...
```

The preceding accelerator copies all files from accelerator **`<root>`** while applying some text replacements only to **`pom.xml`** files. Other files are copied verbatim.

Here in more detail is how this works:

- **Transform A** is applied to the files from accelerator **`<root>`**. It selects all files, including **`pom.xml`** files.
- **Transform B** is *also* applied to the files from accelerator **`<root>`**. Again, **`Merge`** passes the same input independently to each of its child transforms. Transform B selects **`pom.xml`** files and replaces some text in them.

So both **Transform A** and **Transform B** output **`pom.xml`** files. The fact that both result sets contain the same file, and with different contents in them in this case, is a conflict that has to be resolved. By default, **`Combo`** follows a simple rule to resolve such conflicts: take the contents from the last child. Essentially, it behaves as if you overlaid both result sets one after another into the same location. The contents of the latter overwrite any previous files placed there by the earlier.

In the preceding example, this means that while both **Transform A** and **Transform B** produce contents for **`pom.xml`**, the contents from **Transform B** "wins." So you get the version of the **`pom.xml`** that has text replacements applied to it rather than the verbatim copy from **Transform A**.

Conditional transforms

Every **`<transform-definition>`** can have a **`condition`** attribute.

```
  - condition: "#k8sConfig == 'k8s-resource-simple'"
    include: [ "kubernetes/app/*.yaml" ]
    chain:
      - type: ReplaceText
        substitutions:
```

```
        - text: hello-fun
          with: "#artifactId"
```

When a transform's condition is **`false`**, that transform is "disabled." This means it is replaced by a transform that "does nothing." However, doing nothing can have different meanings depending on the context:

- When in the context of a **`Merge`**, a disabled transform behaves like something that returns an empty set. A **`Merge`** adds things together using a kind of union; adding an empty set to union essentially does nothing.
- When in the context of a **`'Chain`** however, a disabled transform behaves like the **`identity`** function instead (that is, **`lambda (x) => x`**). When you chain functions together, a value is passed through all functions in succession. So each function in the chain has the chance to "do something" by returning a different modified value. If you are a function in a chain, to do nothing means to return the input you received unchanged as your output.

If this all sounds confusing, fortunately there is a basic rule of thumb for understanding and predicting the effect of a disabled transform in the context of your accelerator definition. Namely, if a transform's condition evaluates to false, pretend it isn't there. In other words, your accelerator behaves as if you deleted (or commented out) that transform's YAML text from the accelerator definition file.

The following examples illustrate both cases.

Conditional 'Merge' transform

This example, **transform A**, has a conditional transform in a **`Merge`** context:

```
merge:
  - condition: "#k8sConfig == 'k8s-resource-simple'"
    include: [ "kubernetes/app/*.yaml" ]
    chain:
      ...
  - include: [ "pom.xml" ]
    chain:
      ...
```

If the condition of **transform A** is **`false`**, it is replaced with an "empty set" because it is used in a **`Merge`** context. This has the same effect as if the whole of **transform A** was deleted or commented out:

```
merge:
  - include: [ "pom.xml" ]
    chain:
      ...
```

In this example, if the condition is **`false`**, only **`pom.xml`** file is in the result.

Conditional 'Chain' transform

In the following example, some conditional transforms are used in a **`Chain`** context:

```
merge:
- include: [ '**/*.json' ]
  chain:
  - type: ReplaceText
    condition: '#customizeJson'
    substitutions: ...
  - type: JsonPrettyPrint
    condition: '#prettyJson'
    indent: '#jsonIndent'
```

The **`JsonPrettyPrint`** transform type is purely hypothetical. There *could* be such a transform, but VMware doesn't currently provide it.

In the preceding example, both **transform A** and **transform B** are conditional and used in a **`Chain`** context. **Transform A** is chained after the **`include`** transform. Whereas **transform B** is chained after **transform A**. When either of these conditions is **`false`**, the corresponding transform behaves like the identity function. Namely, whatever set of files it receives as input is exactly what it returns as output.

This behavior accords with our rule of thumb. For example, if **transform A**'s condtion is **`false`**, it behaves as if **transform A** wasn't there. **Transform A** is chained after **`include`** so it receives the **`include`**'s result, returns it unchanged, and this is passed to **transform B**. In other words, the result of the **`include`** is passed as is to **transform B**. This is precisely what would happen were **transform A** not there.

A small gotcha with using conditionals in merge transforms

As mentioned earlier, it is a useful pattern to use merges with overlapping contents. Yet you must be careful using this in combination with conditional transforms.

For example:

```
engine:
  merge:
  - include: ["**/*"]
  - include: ["**/pom.xml"]
    chain:
    - type: ReplaceText
      subsitutions: ...
```

Now add a little twist. Say you only wanted to include pom files if the user selects a **`useMaven`** option. You might be tempted to add a 'condition' to **transform B** to disable it when that option isn't selected:

```
engine:
  merge:
  - include: "**/*"
  - condition: '#useMaven'
```

```
    include: ["**/pom.xml"]
    chain:
    - type: ReplaceText
      subsitutions: ...
```

However, this doesn't do what you might expect. The final result *still* contains `pom.xml` files. To understand why, recall the rule of thumb for disabled transforms: If a transform is disabled, pretend it isn't there. So when `#useMaven` is `false`, the example reduces to:

```
engine:
  merge:
  - include: ["**/*"]
```

This accelerator copies all files from accelerator `<root>`, *including* `pom.xml`.

There are several ways to avoid this pitfall. One is to ensure the `pom.xml` files are not included in **transform A** by explicitly excluding them:

```
  ...
  - include: ["**/*"]
    exclude: ["**/pom.xml"]
  ...
```

Another way is to apply the exclusion of pom.xml conditionally in a `Chain` after the main transform:

```
engine:
  merge:
  - include: ["**/*"]
  - include: ["**/pom.xml"]
    chain:
    - type: ReplaceText
        subsitutions: ...
  chain:
  - condition: '!#useMaven'
    exclude: ['**/pom.xml']
```

Merge conflict

The representation of the set of files upon which transforms operate is "richer" than what you can physically store on a file system. A key difference is that in this case, the set of files allows for multiple files with the same path to exist at the same time. When files are initially read from a physical file system, or a ZIP file, this situation does not arise. However, as transforms are applied to this input, it can produce results that have more than one file with the same path and yet different contents.

Earlier examples illustrated this happening through a `merge` operation. Again, for example:

```
merge:
- include: ["**/*"]
- include: ["**/pom.xml"]
  chain:
```

```
  - type: ReplaceText
    subsitutions: ...
```

The result of the preceding `merge` is two files with path `pom.xml`, assuming there was a `pom.xml` file in the input. **Transform A** produces a `pom.xml` that is a verbatim copy of the input file. **Transform B** produces a modified copy with some text replaced in it.

It is impossible to have two files on a disk with the same path. Therefore, this conflict must be resolved before you can write the result to disk or pack it into a ZIP file.

As the example shows, merges are likely to give rise to these conflicts, so you might call this a "merge conflict." However, such conflicts can also arise from other operations. For example, `RewritePath`:

```
type: RewritePath
regex: '.*.md'
rewriteTo: "'docs/README.md'"
```

This example renames any `.md` file to `docs/README.md`. Assuming the input contains more than one `.md` file, the output contains multiple files with path `docs/README.md`. Again, this is a conflict, because there can only be one such file in a physical file system or ZIP file.

Resolving "merge" conflicts

By default, when a conflict arises, the engine doesn't do anything with it. Our internal representation for a set of files allows for multiple files with the same path. The engine carries on manipulating the files as is. This isn't a problem until the files must be written to disk or a ZIP file. If a conflict is still present at that time, an error is raised.

If your accelerator produces such conflicts, they must be resolved before writing files to disk. To this end, VMware provides the UniquePath transform transform. This transform allows you to specify what to do when more than one file has the same path. For example:

```
chain:
- type: RewritePath
  regex: '.*.md'
  rewriteTo: "'docs/README.md'"
- type: UniquePath
  strategy: Append
```

The result of the above transform is that all `.md` files are gathered up and concatenated into a single file at path `docs/README.md`. Another possible resolution strategy is to keep only the contents of one of the files. See Conflict resolution.

Combo transform transform also comes with some convenient built-in support for conflict resolution. It automatically selects the `UseLast` strategy if none is explicitly supplied. So in practice, you rarely, if ever, need to explicitly specify a conflict resolution strategy.

File ordering

As mentioned earlier, our set of files representation is richer than the files on a typical file system in that it allows for multiple files with the same path. Another way in which it is richer is that the files in the set are "ordered." That is, a **`FileSet`** is more like an ordered list than an unordered set.

In most situations, the order of files in a **`FileSet`** doesn't matter. However, in conflict resolution it *is* significant. If you look at the preceding **`RewritePath`** example again, you might wonder about the order in which the various **`.md`** files are appended to each other. This ordering is determined by the order of the files in the input set.

So what is that order? In general, when files are read from disk to create a **`FileSet`**, you cannot assume a specific order. Yes, the files are read and processed in a sequential order, but the actual order is not well defined. It depends on implementation details of the underlying file system. The accelerator engine therefore does not ensure a specific order in this case. It only ensures that it *preserves* whatever ordering it receives from the file system, and processes files in accord with that order.

As an accelerator author, better to avoid relying on the file order produced from reading directly from a file system. So it's better to avoid doing something like the preceding **`RewritePath`** example, *unless* you do not care about the ordering of the various sections of the produced **`README.md`** file.

If you do care and want to control the order explicitly, you use the fact that **`Merge`** processes its children in order and reflects this order in the resulting output set of files. For example:

```
chain:
  - merge:
      - include: ['README.md']
      - include: ['DEPLOYMENT.md']
        chain:
          - type: RewritePath
            rewriteTo: "'README.md'"
  - type: UniquePath
    strategy: Append
```

In this example, **`README.md`** from the first child of **`merge`** definitely comes before **`DEPLOYMENT.md`** from the second child of **`merge`**. So you can control the merge order directly by changing the order of the merge children.

Next steps

This introduction focused on an intuitive understanding of the **`<transform-definition>`** notation. This notation defines precisely how the accelerator engine generates new project content from the files in the accelerator root.

To learn more, read the following more detailed documents:

- An exhaustive Transforms reference of all built-in transform types
- A sample, commented accelerator.yaml to learn from a concrete example

Transforms reference

Available transforms

Here is a list of available transforms and a brief description of their uses. You can use:

- Combo transform as a shortcut notation for many common operations. It combines the behaviors of many of the other transforms.
- Include transform to select files to operate on.
- Exclude transform to select files to operate on.
- Merge transform to work on subsets of inputs and to gather the results at the end.
- Chain transform to apply several transforms in sequence using function composition.
- Let transform to introduce new scoped variables to the model.
- ReplaceText transform to perform simple token replacement in text files.
- RewritePath transform to move files around using regular expression (regex) rules.
- OpenRewriteRecipe transform to apply Rewrite recipes, such as package rename.
- YTT transform to run the `ytt` tool on its input files and gather the result.
- UseEncoding transform to set the encoding to use when handling files as text.
- UniquePath transform to decide what to do when several files end up on the same path.

See also

- Conflict resolution

Combo transform

The `Combo` transform is the Swiss army knife of transforms. You might often use it without even realizing it. Whenever you author a node in the transform tree without specifying `type: x`, you're using `Combo`.

`Combo` combines the behaviors of Include transform, Exclude transform, Merge transform, Chain transform, UniquePath transform, and even Let transform in a way that feels natural.

Syntax reference

Here is the full syntax of `Combo`:

```
type: Combo                  # This can be omitted, because Combo is the default transform
type.
let:                        # See Let.
  - name: <string>
    expression: <SpEL expression>
  - name: <string>
    expression: <SpEL expression>
condition: <SpEL expression>
```

```
include: [<ant pattern>]    # See Include.
exclude: [<ant pattern>]    # See Exclude.
merge:                      # See Merge.
  - <m1-transform>
  - <m2-transform>
  - ...
chain:                    # See Chain.
  - <c1-transform>
  - <c2-transform>
  - ...
onConflict: <conflict resolution> # See UniquePath.
```

Behavior

A few things to know about properties of the **`Combo`** transform:

- They all have defaults.
- They are all optional.
- You must use at least one. An empty, unconfigured **`Combo`**, like such as any other transform, serves no purpose.

When you configure the **`Combo`** transform with all properties, it behaves as follows:

1. Applies the **`include`** as if it were the first element of a Chain transform. The default value is **`['**']`**; if not present, all files are retained.
2. Applies the **`exclude`** as if it were the second element of the chain. The default value is **`[]`**; if not present, no files are excluded. At this point of the chain, only files that match the **`include`**, but are not excluded by the **`exclude`**, remain.
3. Feeds all those files as input to all transforms declared in the **`merge`** property, exactly as Merge transform does. The result of that **`Merge`**, which is the third transform in the big chain, is another set of files. If there are no elements in **`merge`**, the previous result is directly fed to the next step.
4. The result of the merge step is prone to generate duplicate entries for the same **`path`**. So it's implicitly forwarded to a UniquePath transform check, configured with the **`onConflict`** Conflict resolution. The default policy is to retain files appearing later. The results of the transform that appear later in the **`merge`** block "win" against results appearing earlier.
5. Passes that result as the input to the Chain transform defined by the **`chain`** property. Put another way, the chain is prolonged with the elements defined in **`chain`**. If there are no elements in **`chain`**, it's as if the previous result was used directly.
6. If the **`let`** property is defined in the **`Combo`**, the whole execution is wrapped inside a Let transform that exposes its derived symbols.

To recap in pseudo code, a giant **`Combo`** behaves like this:

```
Let(symbols, in:
    Chain(
```

```
        include,
        exclude,
        Chain(Merge(<m1-transform>, <m2-transform>, ...), UniquePath(onConflict)),
        Chain(<c1-transform>, <c2-transform>, ...)
    )
)
```

You rarely use at any one time all the features that **Combo** offers. Yet **Combo** is a good way to author other common building blocks without having to write their **type: x** in full.

For example, this:

```
include: ['**/*.txt']
```

is a perfectly valid way to achieve the same effect as this:

```
type: Include
patterns: ['**/*.txt']
```

Similarly, this:

```
chain:
  - type: T1
    ...
  - type: T2
    ...
```

is often preferred over the more verbose:

```
type: Chain
transformations:
  - type: T1
    ...
  - type: T2
    ...
```

As with other transforms, the order of declaration of properties has no impact. We've used a convention that mimics the actual behavior for clarity, but the following applies **T1** and **T2** on all **.yaml** files even though we VMware has placed the **include** section after the **merge** section.

```
merge:
  - type: T1
  - type: T2
include: ["*.yaml"]
```

In other words, **Combo** applies **include** filters before **merge** irrespective of the physical order of the keys in YAML text. It's therefore a good practice to place the **include** key before the **merge** key. This makes the accelerator definition more readable, but has no effect on its execution order.

Examples

The following are typical use cases for **Combo**.

To apply separate transformations to separate sets of files. For example, to all `.yaml` files and to all `.xml` files:

```
merge:                    # This uses the Merge syntax in a first Combo.
  - include: ['*.yaml']      # This actually nests a second Combo inside the first.
    chain:
      - type: T1
      - type: T2
  - include: ['*.yaml']      # Here comes a third Combo, used as the 2nd child inside the
first
    chain:
      - type: T3
      - type: T4
```

To apply **T1** then **T2** on all `.yaml` files that are *not* in any `secret` directory:

```
include: ['**/*.yaml']
exclude: ['**/secret/**']
chain:
  - type: T1
    ..
  - type: T2
    ..
```

Include transform

The `Include` transform retains files based on their `path`, letting in *only* those files whose path matches at least one of the configured `patterns`. The contents of files, and any of their other characteristics, are unaffected.

`Include` is a basic building block seldom used as is, which makes sense if composed inside a Chain transform or a Merge transform. It is often more convenient to leverage the shorthand notation offered by Combo transform.

Syntax reference

```
type: Include
patterns: [<ant pattern>]
condition: <SpEL expression>
```

Examples

```
type: Chain
transformations:
  - type: Include
    patterns: ["**/*.yaml"]
  - type: # At this point, only yaml files are affected
```

See also

- Exclude transform

- Combo transform

Exclude transform

The **`Exclude`** transform retains files based on their **`path`**, letting everything in *except* those files whose path matches *at least* one of the configured **`patterns`**. The contents of files, and any of their other characteristics, are unaffected.

`Exclude` is a basic building block seldom used *as is*, which makes sense if composed inside a Chain transform or a Merge transform. It is often more convenient to leverage the shorthand notation offered by Combo transform.

Syntax reference

```
type: Exclude
patterns: [<ant pattern>]
condition: <SpEL expression>
```

Examples

```
type: Chain
transformations:
  - type: Exclude
    patterns: ["**/secret/**"]
  - type: # At this point, no file matching **/secret/** is affected.
```

See also

- Include transform
- Combo transform

Merge transform

The **`Merge`** transform feeds a copy of its input to several other transforms and *merges* the results together using set union.

A **`Merge`** of **T1**, **T2**, and **T3** applied to input **I** results in **T1(I)** ∪ **T2(I)** ∪ **T3(I)**.

An empty merge produces nothing (∅).

Syntax reference

```
type: Merge
sources:
  - <transform>
  - <transform>
  - <transform>
  - ...
condition: <SpEL expression>
```

See also

- Combo transform is often used to express a **`Merge`** **and** other transformations in a shorthand syntax.

Chain transform

The **`Chain`** transform uses function composition to produce its final output.

A chain of **T1** then **T2** then **T3** first applies transform **T1**. It then applies **T2** to the output of **T1**, and finally applies **T3** to the output of that. In other words, **T3** o **T2** o **T1**.

An empty chain acts as function identity.

Syntax reference

```
type: Chain
transformations:
  - <transform>
  - <transform>
  - <transform>
  - ...
condition: <SpEL expression>
```

Let transform

The **`Let`** transform wraps another transform, creating a new scope that extends the existing scope.

SpEL expressions inside the **`Let`** can access variables from both the existing scope and the new scope.

> **Note:** Variables defined by the **`Let`** should not shadow existing variables. If they do, those existing variables won't be accessible.

Syntax reference

```
type: Let
symbols:
- name: <string>
  expression: <SpEL expression>
- ...
in: <transform> # <- new symbols are visible in here
```

Execution

The **`Let`** adds variables to the new scope by computation ofSpEL expressions.

```
engine:
  let:
  - name: <string>
    expression: <SpEL expression>
  - ...
```

Both a **`name`** and an **`expression`** must define each symbol where:

- **`name`** must be a camelCase string name. If a let *symbol* happens to have the same name as a symbol already defined in the surrounding scope, then the local symbol shadows the symbol from the surrounding scope. This makes the variable from the surrounding scope inaccessible in the remainder of the **`Let`** but doesn't alter its original value.
- **`expression`** must be a valid SpEL expression expressed as a YAML string. Be careful when using the **`#`** symbol for variable evaluation, because this is the comment marker in YAML. So SpEL expressions in YAML must enclose strings in quotes or rely on block style. For more information about block style, see Block Style Productions.

Symbols defined in the **`Let`** are evaluated in the new scope in the order they are defined. This means that symbols lower in the list can make use of the variables defined higher in the list but not the other way around.

See also

- Combo transform provides a way to declare a **`Let`** scope and other transforms in a short syntax.

ReplaceText transform

The **`ReplaceText`** transform allows replacing one or several text tokens in files as they are being copied to their destination. The replacement values are the result of dynamic evaluation of SpEL expressions.

This transform is text-oriented and requires knowledge of how to interpret the stream of bytes that make up the file contents into text. All files are assumed to use **`UTF-8`** encoding by default, but you can use the UseEncoding transform transform upfront to specify a different charset to use on some files.

You can use **`ReplaceText`** transform in one of two ways:

- To replace several literal text tokens.
- To define the replacement behavior using a single regular expression, in which case the replacement SpEL expression can leverage the regex capturing group syntax.

Syntax reference

Syntax reference for replacing several literal text tokens:

```
type: ReplaceText
substitutions:
  - text: STRING
    with: SPEL-EXPRESSION
  - text: STRING
    with: SPEL-EXPRESSION
  - ..
condition: SPEL-EXPRESSION
```

Syntax reference for defining the replacement behavior using a *single* regular expression:

> **Note:** Regex is used to match the entire document. To match on a per line basis, enable multiline mode by including `(?m)` in the regex.

```
type: ReplaceText
regex:
  pattern: REGULAR-EXPRESSION
  with: SPEL-EXPRESSION
condition: SPEL-EXPRESSION
```

In both cases, the SpEL expression can use the special `#files` helper object. This enables the replacement string to consist of the contents of an accelerator file.See the following example.

Another set of helper objects are functions of the form `xxx2Yyyy()` where `xxx` and `yyy` can take the value `camel`, `kebab`, `pascal`, or `snake`. For example, `camel2Snake()` enables changing from camelCase to snake_case.

Examples

Replacing the hardcoded string `"hello-world-app"` with the value of variable `#artifactId` in all `.md`, `.xml`, and `.yaml` files.

```
include: ['**/*.md', '**/*.xml', '**/*.yaml']
chain:
  - type: ReplaceText
    substitutions:
      - text: "hello-world-app"
        with: "#artifactId"
```

Doing the same in the `README-fr.md` and `README-de.md` files, which are encoded using the `ISO-8859-1` charset:

```
include: ['README-fr.md', 'README-de.md']
chain:
  - type: UseEncoding
    encoding: 'ISO-8859-1'
  - type: ReplaceText
    substitutions:
      - text: "hello-world-app"
        with: "#artifactId"
```

Similar to the preceding example, but making sure the value appears as kebab case, while the entered `#artifactId` is using camel case:

```
include: ['**/*.md', '**/*.xml', '**/*.yaml']
chain:
  - type: ReplaceText
    substitutions:
      - text: "hello-world-app"
        with: "#camel2Kebab(#artifactId)"
```

Replacing the hardcoded string `"REPLACE-ME"` with the contents of file named after the value of the `#platform` option in `README.md`:

```
include: ['README.md']
chain:
  - type: ReplaceText
    substitutions:
      - text: "REPLACE-ME"
        with: "#files.contentsOf('snippets/install-' + #platform + '.md')"
```

See also

- UseEncoding transform

RewritePath transform

The `RewritePath` transform allows you to change the name and path of files without affecting their content.

Syntax reference

```
type: RewritePath
regex: <string>
rewriteTo: <SpEL expression>
matchOrFail: <boolean>
```

For each input file, `RewritePath` attempts to match its `path` by using the regular expression (regex) defined by the `regex` property. If the regex matches, `RewritePath` changes the `path` of the file to the evaluation result of `rewriteTo`.

`rewriteTo` is an expression that has access to the overall engine model and to variables defined by capturing groups of the regular expression. Both *named capturing groups* `(?<example>[a-z]*)` and regular *index-based* capturing groups are supported. `g0` contains the whole match, `g1` contains the first capturing group, and so on.

If the regex doesn't match, the behavior depends on the `matchOrFail` property:

- If set to `false`, which is the default, the file is left untouched.
- If set to `true`, an error occurs. This prevents misconfiguration if you expect all files coming in to match the regex. For more information about typical interactions between `RewritePath` and `Chain + Include`, see the following section, Interaction with Chain and Include.

The default value for `regex` is the following regular expression, which provides convenient access to some named capturing groups:

```
^(?<folder>.*/)?(?<filename>([^/]+?|)(?=(?<ext>\.[^/.]*)?)$)
```

Using `some/deep/nested/file.xml` as an example, the preceding regular expression captures:

- **folder:** The full folder path the file is in. In this example, `some/deep/nested/`.

- **filename:** The full name of the file, including extension *if present*. In this example, `file.xml`.
- **ext:** The last dot and extension in the filename, *if present*. In this example, `.xml`.

The default value for `rewriteTo` is the expression `#folder + #filename`, which doesn't rewrite paths.

Examples

The following moves all files from `src/main/java` to `sub-module/src/main/java`:

```
type: RewritePath
regex: src/main/java/(.*)
rewriteTo: "'sub-module/src/main/java' + #g1"   # 'sub-module/' + #g0 works too
```

The following flattens all files found inside the `sub-path` directory and its subdirectories, and puts them into the `flattened` folder:

```
type: RewritePath
regex: sub-path/(.*/)*(?<filename>[^/]+)
rewriteTo: "'flattened' + #filename"   # 'flattened' + #g2 would work too
```

The following turns all paths into lowercase:

```
type: RewritePath
rewriteTo: "#g0.toLowerCase()"
```

Interaction with Chain and Include

It's common to define pipelines that perform a `Chain` of transformations on a subset of files, typically selected by `Include/Exclude`:

```
- include: "**/*.java"
- chain:
    - # do something here
    - # and then here
```

If one of the transformations in the chain is a `RewritePath` operation, chances are you want the rewrite to apply to *all* files matched by the `Include`. For those typical configurations, you can set the `matchOrFail` guard to `true` to ensure the `regex` you provide indeed matches all files coming in.

See also

- Use UniquePath transform to ensure rewritten paths don't clash with other files, or to decide which path to select if they do clash.

OpenRewriteRecipe transform

The `OpenRewriteRecipe` transform allows you to apply any Open Rewrite **Recipe** to a set of files and gather the results.

> **Note:** Currently, only Java related recipes are supported. The engine leverages version `7.0.0` of Open Rewrite and parses Java files using the grammar for Java 11.

Syntax reference

```
type: OpenRewriteRecipe
recipe: <string>                  # Full qualified classname of the recipe
options:
  <string>: <SpEL expression>      # Keys and values depend on the class of the recipe
  <string>: <SpEL expression>      # Refer to the documentation of said recipe
  ...
```

Example

The following example applies the ChangePackage Recipe to a set of Java files in the `com.acme` package and moves them to the value of `#companyPkg`. This is more powerful than using RewritePath transform and ReplaceText transform, as it reads the syntax of files and correctly deals with imports, fully vs. non-fully qualified names, and so on.

```
chain:
  - include: ["**/*.java"]
  - type: OpenRewriteRecipe
    recipe: org.openrewrite.java.ChangePackage
    options:
      oldFullyQualifiedPackageName: "'com.acme'"
      newFullyQualifiedPackageName: "#companyPkg"
      recursive: true
```

YTT transform

The `YTT` transform starts the YTT template engine as an external process.

Syntax reference

```
type: YTT
extraArgs: # optional
  - <SPEL-EXPRESSION-1>
  - <SPEL-EXPRESSION-2>
  - ...
```

The `YTT` transform's YAML notation does not require any parameters. When invoked without parameters, which is the typical use case, the YTT transform's input is determined entirely by two things only:

1 The input files fed into the transform.

2 The current values for options and derived symbols.

Execution

YTT is invoked as an external process with the following command line:

```
ytt -f <input-folder> \
    --data-values-file <symbols.json> \
    --output-files <output-folder> \
    <extra-args>
```

The **<input-folder>** is a temporary directory into which the input files are "materialized." That is, the set of files passed to the YTT transform as input is written out into this directory to allow the YTT process to read them.

The **<symbols.json>** file is a temporary JSON file, which the current option values and derived symbols are materialized in the form of a JSON map. This allows YTT templates in the **<input-folder>** to make use of these symbols during processing.

The **<output-folder>** is a fresh temporary directory that is empty at the time of invocation. In a typical scenario, upon completion, the output directory contains files generated by YTT.

The **<extra-args>** are additional command line arguments obtained by evaluating the SPEL expressions from the **extraArgs** attribute.

When the **ytt** process completes with a 0 exit code, this is considered a successful execution and the contents of the output directory is taken to be the result of the YTT transform.

When the **ytt** process completes with a non 0 exit code, the execution of the **YTT** transform is considered to have failed and an exception is raised.

Examples

Basic invocation

When you want to execute **ytt** on the contents of the entire accelerator repository, use the YTT transform as your only transform in the engine declaration.

```
accelerator:
  ...
engine:
  type: YTT
```

> **Note:** To do anything beyond calling YTT, compose YTT into your accelerator flow using merge or chain combinators. This is exactly the same as composing any other type of transform.

For example, when you want to define some derived symbols as well as merge the results from YTT with results from other parts of your accelerator transform, you can reference this example:

```
engine:
  let: # Define derived symbols visible to all transforms (including YTT)
  - name: theAnswer
    expression: "41 + 1"
  merge:
```

```
  - include: ["deploy/**.yml"] # select some yaml files to process with YTT
    chain: # Chain selected yaml files to YTT
      type: YTT
  - ... include/generate other stuff to be merged alongside yaml generated by YTT...
```

The preceding example uses a combination of Chain transform and Merge transform. You can use either **`Merge`** or **`Chain`** or both to compose YTT into your accelerator flow. Which one you choose depends on how you want to use YTT as part of your larger accelerator.

Using `extraArgs`

The **`extraArgs`** passes additional command line arguments to YTT. This adds file marks. See File Marks in the Carvel documentation.

For example, the following runs YTT and renames the **`foo/demo.yml`** file in its output to **`bar/demo.yml`**.

```
engine:
  type: YTT
  extraArgs: ["'--file-mark'",  "'foo/demo.yml:path=bar/demo.yml'"]
```

> **Note:** The **`extraArgs`** attribute expects SPEL expressions. Take care to use proper escaping of literal strings using double and single quotes (that is, `"'LITERAL-STRING'").

UseEncoding transform

When considering files in textual form, for example, when doing text replacement with the ReplaceText transform, the engine must decide which encoding to use.

By default, **`UTF-8`** is assumed. If any files must be handled differently, use the **`UseEncoding`** transform to annotate them with an explicit encoding.

> **Note:** **`UseEncoding`** returns an error if you apply encoding to files that have already been explicitly configured with a particular encoding.

Syntax reference

```
type: UseEncoding
encoding: <encoding>    # As recognized by the java java.nio.charset.Charset class
condition: <SpEL expression>
```

Supported encoding names include, for example, **`UTF-8`**, **`US-ASCII`**, and **`ISO-8859-1`**.

Example use

`UseEncoding` is typically used as an upfront transform to, for example, ReplaceText transform in a chain:

```
type: Chain   # Or using "Combo"
transformations:
  - type: UseEncoding
    encoding: ISO-8859-1
```

```
  - type: ReplaceText
    substitutions:
      - text: "hello"
        with: "#howToSayHello"
```

See also

- ReplaceText transform

UniquePath transform

You can use the `UniquePath` transform to ensure there are no `path` conflicts between files transformed. You can often use this at the tail of a Chain transform.

Syntax reference

```
type: UniquePath
strategy: <conflict resolution>
condition: <SpEL expression>
```

Examples

The following example concatenates the file that was originally named `DEPLOYMENT.md` to the file `README.md`:

```
chain:
  - merge:
      - include: ['README.md']
      - include: ['DEPLOYMENT.md']
        chain:
          - type: RewritePath
            rewriteTo: "'README.md'"
  - type: UniquePath
    strategy: Append
```

See also

- `UniquePath` uses a Conflict resolution strategy to decide what to do when several input files use the same `path`.
- Combo transform implicitly embeds a `UniquePath` after the Merge transform defined by its `merge` property.

Conflict resolution

This topic describes how to resolve conflicts that transforms might produce.

For example, if you're using Merge transform (or Combo transform's `merge` syntax) or RewritePath transform, a transform can produce several files at the same `path`. The engine then must take an action: Should it keep the last file? Report an error? Concatenate the files together?

Such conflicts can arise for a number of reasons. You can avoid or resolve them by configuring transforms with a *conflict resolution*. For example:

- Combo transform uses UseLast by default, but you can configure it to do otherwise.
- You can explicitly end a transform Chain transform with a UniquePath transform, which by default uses Fail. This is customizable.

Syntax reference

```
type: Combo      # often omitted
merge:
  - <transform>
chain:
  - <transform>
  - ...
onConflict: <conflict resolution>  # defaults to 'UseLast'
```

```
type: Chain      # or implicitly using Combo
transformations:
  - <transform>
  - <transform>
  - type: UniquePath
    strategy: <conflict resolution>  # defaults to 'Fail'
```

Available strategies

The following values and behaviors are available:

- **`Fail`**: Stop processing on the first file that exhibits **`path`** conflicts.
- **`UseFirst`**: For each conflicting file, the file produced first (typically by a transform appearing earlier in the YAML definition) is retained.
- **`UseLast`**: For each conflicting file, the file produced last (typically by a transform appearing later in the YAML definition) is retained.
- **`Append`**: The conflicting versions of files are concatenated (as if using **`cat file1 file2 ...`**), with files produced first appearing first.

See also

- Combo transform
- UniquePath transform

SpEL samples

This document shows some common Spring Expression Language (SpEL) use cases for the **`accelerator.yaml`** file.

Variables

You can reference all the values added as options in the **accelerator** section from the YAML file as variables in the **engine** section. You can access the value using the syntax **#<option name>**:

```
options:
  - name: foo
    dataType: string
    inputType: text
...
engine:
  - include: ["some/file.txt"]
    chain:
    - type: ReplaceText
      substitutions:
      - text: bar
        with: "#foo"
```

This sample replaces every occurrence of the text **bar** in the file **some/file.txt** with the contents of the **foo** option.

Implicit variables

Some variables are made available to the model by the engine, including:

- **artifactId** is a built-in value derived from the **projectName** passed in from the UI with spaces replaced by "_". If that value is empty, it is set to **app**.
- **files** is a helper object that currently exposes the **contentsOf(<path>)** method. For more information, see ReplaceText transform.
- **camel2Kebab** and other variations of the form **xxx2Yyyy** are a series of helper functions for dealing with changing case of words. For more information, see ReplaceText transform.

Conditionals

You can use Boolean options for conditionals in your transformations.

```
options:
  - name: numbers
      inputType: select
      choices:
        first: First Option
        second: Second Option
      defaultValue: first
...
engine:
  - include: ["some/file.txt"]
    condition: "#numbers == 'first'"
    chain:
    - type: ReplaceText
      substitutions:
```

```
      - text: bar
        with: "#foo"
```

This replaces the text only if the selected option is the first one.

Rewrite path concatenation

```
options:
  - name: renameTo
    dataType: string
    inputType: text
...
engine:
  - include: ["some/file.txt"]
    chain:
    - type: RewritePath
      rewriteTo: "'somewhere/' + #renameTo + '.txt'"
```

Regular expressions

Regular expressions allow you to use patterns as a matcher for strings. Here is a small example of what you can do with them:

```
options:
  - name: foo
    dataType: string
    inputType: text
    defaultValue: abcZ123
...
engine:
  - include: ["some/file.txt"]
    condition: "#foo matches '[a-z]+Z\\d+'"
    chain:
    - type: ReplaceText
      substitutions:
      - text: bar
        with: "#foo"
```

This example uses RegEx to match a string of letters that ends with a capital Z and any number of digits. If this condition is fulfilled, the text is replaced in the file, **`file.txt`**.

Accelerator custom resource definition

The **`Accelerator`** custom resource definition (CRD) defines any accelerator resources to be made available to the Application Accelerator for VMware Tanzu system. It is a namespaced CRD, meaning that any resources created belong to a namespace. In order for the resource to be available to the Application Accelerator system, it must be created in the namespace that the Application Accelerator UI server is configured to watch.

API definitions

The **`Accelerator`** CRD is defined with the following properties:

Property	Value
Name	Accelerator
Group	accelerator.apps.tanzu.vmware.com
Version	v1alpha1
ShortName	acc

The **`Accelerator`** CRD *spec* defined in the **`AcceleratorSpec`** type has the following fields:

Field	Description	Required/ Optional
displayName	A short descriptive name used for an Accelerator.	Optional (*)
description	A longer description of an Accelerator.	Optional (*)
iconUrl	A URL for an image to represent the Accelerator in a UI.	Optional (*)
tags	An array of strings defining attributes of the Accelerator that can be used in a search.	Optional (*)
git	Defines the accelerator source Git repository.	Optional (***)
git.url	The repository URL, can be a HTTP/S or SSH address.	Optional (***)
git.ignore	Overrides the set of excluded patterns in the .sourceignore format (which is the same as .gitignore). If not provided, a default of **`.git/`** is used.	Optional (**)
git.interval	The interval at which to check for repository updates. If not provided it defaults to 10 min. There is an additional refresh interval (currently 10s) involved before accelerators may appear in the UI. There could be a 10s delay before changes are reflected in the UI.*	Optional (**)
git.ref	Git reference to checkout and monitor for changes, defaults to master branch.	Optional (**)
git.ref.branch	The Git branch to checkout, defaults to master.	Optional (**)
git.ref.commit	The Git commit SHA to checkout, if specified tag filters are ignored.	Optional (**)
git.ref.semver	The Git tag semver expression, takes precedence over tag.	Optional (**)
git.ref.tag	The Git tag to checkout, takes precedence over branch.	Optional (**)
git.secretRef	The secret name containing the Git credentials. For HTTPS repositories, the secret must contain user name and password fields. For SSH repositories, the secret must contain identity, identity.pub, and known_hosts fields.	Optional (**)
source	Defines the source image repository.	Optional (***)

Field	Description	Required/ Optional
source.image	Image is a reference to an image in a remote registry.	Optional (***)
source.imagePullSecrets	ImagePullSecrets contains the names of the Kubernetes Secrets containing registry login information to resolve image metadata.	Optional
source.interval	The interval at which to check for repository updates.	Optional
source.serviceAccountName	ServiceAccountName is the name of the Kubernetes ServiceAccount used to authenticate the image pull if the service account has attached pull secrets.	Optional

* Any optional fields marked with an asterisk (*) are populated from a field of the same name in the **`accelerator`** definition in the **`accelerator.yaml`** file if that is present in the Git repository for the accelerator.

** Any fields marked with a double asterisk (**) are part of the Flux GitRepository CRD that is documented in the Flux Source Controller Git Repositories documentation.

*** Any fields marked with a triple asterisk (***) are optional but either **`git`** or **`source`** is required to specify the repository to use. If **`git`** is specified, the **`git.url`** is required, and if **`source`** is specified, **`source.image`** is required.

Excluding files

The **`git.ignore`** field defaults to **`.git/`**, which is different from the defaults provided by the Flux Source Controller GitRepository implementation. You can override this, and provide your own exclusions. For more information, see fluxcd/source-controller Excluding files.

Non-public repositories

For Git repositories that aren't accessible anonymously, you need to provide credentials in a Secret. For HTTPS repositories the secret must contain user name and password fields. For SSH repositories, the secret must contain identity, identity.pub and known_hosts fields. For more information, see fluxcd/source-controller HTTPS authentication and fluxcd/source-controller SSH authentication.

For Image repositories that aren't publicly available, an image pull secret can be provided. For more information, see Using imagePullSecrets.

Examples

A minimal example could look like the following manifest:

hello-fun.yaml

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: hello-fun
spec:
```

```
  git:
    url: https://github.com/sample-accelerators/hello-fun
    ref:
      branch: main
```

This minimal example creates an accelerator named **`hello-fun`**. The **`displayName`**, **`description`**, **`iconUrl`**, and **`tags`** fields are populated based on the content under the **`accelerator`** key in the **`accelerator.yaml`** file found in the **`main`** branch of the Git repository at https://github.com/sample-accelerators/hello-fun. For example:

accelerator.yaml

```
accelerator:
  displayName: Hello Fun
  description: A simple Spring Cloud Function serverless app
  iconUrl: https://raw.githubusercontent.com/simple-starters/icons/master/icon-cloud.png
  tags:
  - java
  - spring
  - cloud
  - function
  - serverless

...
```

We can also explicitly specify the **`displayName`**, **`description`**, **`iconUrl`**, and **`tags`** fields and this overrides any values provided in the accelerator's Git repository. The following example explicitly sets those fields plus the **`ignore`** field:

my-hello-fun.yaml

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: my-hello-fun
spec:
  displayName: My Hello Fun
  description: My own Spring Cloud Function serverless app
  iconUrl: https://github.com/simple-starters/icons/raw/master/icon-cloud.png
  tags:
    - spring
    - cloud
    - function
    - serverless
  git:
    ignore: ".git/, bin/"
    url: https://github.com/sample-accelerators/hello-fun
    ref:
      branch: test
```

Example for a private Git repo

To create an accelerator by using a private Git repository, first create a secret by using HTTP credentials or SSH credentials.

Example using http credentials

Note: For better security, use an access token as the password.

```
kubectl create secret generic https-credentials \
    --from-literal=username=<user> \
    --from-literal=password=<password>
```

https-credentials.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: https-credentials
  namespace: default
type: Opaque
data:
  username: <BASE64>
  password: <BASE64>
```

After you have the secret file, you can create the accelerator by using the **`secretRef`** property:

private-acc.yaml

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: private-acc
spec:
  displayName: private
  description: Accelerator using private repository
  git:
    url: <repository-URL>
    ref:
      branch: main
    secretRef:
      name: https-credentials
```

Example using SSH credentials

```
ssh-keygen -q -N "" -f ./identity
ssh-keyscan github.com > ./known_hosts
kubectl create secret generic ssh-credentials \
    --from-file=./identity \
    --from-file=./identity.pub \
    --from-file=./known_hosts
```

This example assumes you don't have a key file already created. If you do, replace the values using the following format:

```
--from-file=identity=<path to your identity file>

--from-file=identity.pub=<path to your identity.pub file>

--from-file=known_hosts=<path to your know_hosts file>
```

ssh-credentials.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: ssh-credentials
  namespace: default
type: Opaque
data:
  identity: <BASE64>
  identity.pub: <BASE64>
  known_hosts: <BASE64>
```

private-acc-ssh.yaml

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: private-acc
spec:
  displayName: private
  description: Accelerator using private repository
  git:
    url: <repository-URL>
    ref:
      branch: main
    secretRef:
      name: ssh-credentials
```

Specifications

5

The following specifications describe the internal contracts between the engine and other components that make up Application Accelerator:

- Options specification
- Engine specification
- HTTP endpoint specification

This chapter includes the following topics:

Options specification

This section describes the parts of an accelerator manifest file that are relevant for the processing of an accelerator. That is, the metadata that affects the behavior at runtime of the engine. Other parts of the file can be used to alter the presentation, including the presentation of user input widgets in some UIs. Those parts are out of the scope of this document.

Metadata for options

A sample annotated manifest is shown in the following example:

```
accelerator: # the first 3 properties are out of scope of this spec
  name: new-demo
  description: Create a new demo project
  tags:
    - java
    - spring
    - cloud
    - function
    - serverless
  options: # some properties of options are also ignored by this spec
    - name: buildTool
      description: The build tool to use for the project
      dataType: string
      defaultValue: maven
```

```
      inputType: select
      choices:
      - value: maven
        text: Apache Maven
      - value: gradle
        text: Gradle
    - name: configureCI
      description: Whether to add Continuous Integration config files
      dataType: boolean
      defaultValue: true

engine:
  # transformation
```

Options are defined by their **`name`**, **`dataType`** and optional **`defaultValue`**. All other fields are out of scope of this specification and are silently ignored by the *engine*.

`accelerator.options` is a *list* of sub objects defined in the following sections. In the rest of this specification, the notation **`somekey[*]`** refers to a multivalued property.

`accelerator.options[*].name`

Denotes the name of a top-level entry in the **model** at runtime. Name must use *lower camelCase* and no two options can be declared with the same name.

UIs are free to turn the camelCase name into some other label for presentation. For example, **`projectName -> Project Name`** or **`projectName -> --project-name`**. However, the technical key to pass the value must use the camelCase name.

The **`name`** field is required.

`accelerator.options[*].dataType`

Describes the type of the acceptable values for this option. The only supported types are the equivalent of JSON types **`string`**, **`number`**, **`boolean`**, and one-dimensional arrays of the earlier sections. **`null`** is a supported value and conforms to all types.

The value of the **`dataType`** field, if set, must be either:

- A **`string`** with value of either **`"string"`**, **`"number"`**, or **`"boolean"`**. This denotes that the required type of the option is the corresponding type.
- A one-dimension, single element array of **`string`** whose sole element is one of the earlier **`dataType`** fields. This denotes that the type of the option is an array of said type. That is, **`["number"]`** enforces an option whose type is a one-dimension array of numbers.

The **`dataType`** field is optional. Its implied default value is **`"string"`**.

`accelerator.options[*].defaultValue`

Describes the default value that the engine assumes if clients don't provide an explicit value. The way UIs present those values is implementation specific, but in the absence of explicit user-provided value, clients can use the default value by leaving out the option or explicitly send the default value.

The value of the **`defaultValue`** field must be an instance of a JSON/YAML value that conforms to the **`dataType`** declared or implied for the option.

The **`defaultValue`** field is optional and has no default value, meaning that an option with no **`defaultValue`** is **required**.

Engine specification

This section describes the behavior of the *engine* at runtime and how it is influenced by elements of the manifest, combined with input a client provides by using the concept of *option values*.

This document only covers the general contract of accelerator rendering and does not cover the details of invocation and passing of options, nor does it cover the way the result of invocation can be delivered / retrieved.

For details about invocation over http, see HTTP endpoint specification. Other implementations, for example, local invocation by using a CLI, can exist, and the concepts here remain applicable.

Invocation lifecycle

At a high level, the invocation of a single accelerator consists of the following phases:

1 **Pre-validation**: To the best extent possible, the contents of the accelerator files are parsed and understood by the engine. This means that *errors in the configuration of the accelerator are reported early.

   *Errors in the contents of the **`accelerator.yaml`** manifest.

   For any state of the contents of a accelerator, that phase is cacheable. In other words, the same files produce the same outcome.

2 **Model Population with Option Values**: The model is initially populated with all the values provided for invocation. Clients must provide values for all options defined in the Options specification section of the manifest that are not configured with a **`defaultValue`**.

3 **Model Population with Option Values Defaults**: The options defined in the manifest with a **`defaultValue`** and that haven't already been set are given their default value.

   The populated model is then validated against the accelerator manifest:

   a All passed-in options MUST have a valid **`name`**.

   b All known options MUST be present. That is, the set of names declared must be a subset of the ones present.

   c All known options MUST be of a type that conforms to their declared **`dataType`**.

Failure to validate stops processing and causes an error being reported.

4 **Addition of *Standard Variables***: The model is further populated with additional values that the engine always computes, including values that might depend on the contents of an existing target directory.

   The exact set of standard variables is out of the scope of this specification, but the engine never overwrites a user-provided option with a standard variable. That is, authors can always provide the option to override a standard variable.

   Errors can happen while computing the value of a standard variable, in which case processing stops and an error is reported.

5 **Rendering**: All files that make up the contents of the accelerator (except the manifest file itself), and the option values and derived symbols are provided to a transformation process that takes them as input and produces a transformed set of files.

HTTP endpoint specification

This document specifies the contract for running an accelerator in the context of a client-server interaction, where the "http endpoint" is typically running inside a Kubernetes cluster alongside a web UI that allows triggering it.

Context of invocation

In most cases, the endpoint is invoked because a user browsing an Application Accelerator UI fills in values for available accelerator options and clicks **Generate**. The user then is served the result of the processing as a ZIP file or receives an error report. The accelerator engine endpoint is either:

- Provided with a pointer to the accelerator sources ("pull approach"), typically coming from a Git repository as a TAR file.
- Given the accelerator files as a TAR file directly ("push approach") and the set of values the user chose for the accelerator options.

Endpoint contract

Request to run an accelerator is performed by POSTing to the **`/invocations`** endpoint. The mode of operation (push *vs.* pull) is negotiated based on the **`Content-Type`** of the request.

Pull-based approach

When using the pull-based approach, the request must be sent with a JSON (**`Content-Type: application/json`**) formatted payload of the following form:

```
{
  "steps": [
    {
      "sources": {
        "archive": "http://<host>/gitrepository/default/podinfo/
363a6a8fe6a7f13e05d34c163b0ef02a777da20a.tar.gz",
```

```
        "location": "file:///some/local/exploded/path",
        "subpath": "/my-sub-folder"
      },
      "options": {
        "optionOne": true,
        "optionTwo": "a string",
        "optionThree": ["an", "array", "of", "strings"],
        "optionFour": 9999
      }
    }
  ]
}
```

The following is a lightweight specification for that payload:

- The payload MUST be a JSON object with a top-level **`steps`** property, itself being a one-element array of JSON objects.
- That inner object MUST have both of the **`sources`** and **`options`** properties, even if empty.
- The **`sources`** property is an object that MUST contain exactly one of the mutually exclusive properties, **`archive`** or **`location`**. The former is typical in the context of regular use and points to a TAR archive of a repository's contents, for example, from the Flux Git repository. That location MUST be accessible by the accelerator engine with the host correctly qualified. The only supported protocol is http(s). The latter (**`location`**) is used for development purposes only. Do not consider it a feature in the long run. It points to a directory on the local file system.
- Additionally, the **`sources`** object might contain a **`subpath`** property you can consider to be a subfolder inside the contents of the sources to locate the root of the accelerator. That is, the location of **`<ROOT>`** where the **`<ROOT>/accelerator.yaml`** resides. The default value is the empty string. That is, the root of the TAR file contents is to be considered the root of the accelerator. Any other value must be a forward-slash segmented string to be resolved relative to the actual TAR file contents (with no leading slash).
- The **`options`** property is a JSON object containing the values entered by the user, in accordance with the accelerator manifest:
  - All keys of that object must be camelCase words.
    - Default values do not need to be resolved before invocation, because they are resolved server-side.
    - Values must be resolved to their correct JSON type.
    - Given the specification of the accelerator manifest, in practice, the only possible types for values are:
      - JSON Boolean for values whose **`dataType`** is **`boolean`**.
      - JSON string for values whose **`dataType`** is **`string`**.
      - JSON number for values whose **`dataType`** is **`number`**.

- JSON arrays of the preceding.

Push-based approach

When using the push-based approach, the request MUST be sent with a regular http multipart form (**`Content-Type: form/multipart`**) payload where:

- Field named **`0.File`** contains the TAR archive contents of the accelerator files. Notice the capital F in **`0.File`**, which distinguishes this filename from the ones used for options (see below).
- Fields named **`0.<optionName>`** where **`<optionName>`** is the camel case name of an option contain the string representation of an option value (similar to any regular http POST operation).

Endpoint response

Irrespective of the pull *vs.* push approach used by the request, the response to an invocation is either:

- A byte stream, with http status 200 and **`Content-Type: application/zip`** in case of successful invocation, containing the resulting files encoded in a ZIP file. The ZIP file can have an additional top-level directory named after the **`projectName`** option. That is, an accelerator index.html at the root of the accelerator is at **`<projectName>/index.html`** in the resulting ZIP file.
- An error report, with http status 4xx or 5xx and **`Content-Type: application/json`** containing a description of what went wrong, with the following format:

```
```
{
  "title": "...",
  "status": 500,
  "detail": "...",
  "reportString": "...",
  "report": {...}
}
```

Where:

- `title` is a short description of the error.
- `status` has the same semantics as an http error code.
- `detail` provides a longer description of the error.
- `reportString` and `report` might both contain the execution log of the accelerator if invocation went that far. The former is an ASCII art rendering of it, while the latter is a JSON object with the same information.
```

Application Accelerator CLI

6

The Application Accelerator command line interface (CLI) includes commands for developers and operators to create and use accelerators.

This chapter includes the following topics:

Server API connections for operators and developers

The Application Accelerator CLI must connect to a server for all provided commands except for the **`help`** and **`version`** commands.

Operators typically use **create**, **update**, and **delete** commands for managing accelerators in a Kubernetes context. These commands require a Kubernetes context where the operator is already authenticated and is authorized to create and edit the accelerator resources. Operators can also use the **get** and **list** commands by using the same authentication. For any of these commands, the operator can specify the **`--context`** flag to access accelerators in a specific Kubernetes context.

Developers use the **list**, **get**, and **generate** commands for using accelerators available in an Application Accelerator server. Developers use the **`--server-url`** to point to the Application Accelerator server they want to use. The URL depends on the configuration settings for Application Accelerator:

- For installations configured with a **shared ingress**, use **`https://accelerator.<domain>`** where **`domain`** is provided in the values file for the accelerator configuration.
- For installations using a **LoadBalancer**, look up the External IP address by using:

  ```
  kubectl get -n accelerator-system service/acc-server
  ```

  Use **`http://<External-IP>`** as the URL.
- For any other configuration, you can use port forwarding by using:

  ```
  kubectl port-forward service/acc-server -n accelerator-system 8877:80
  ```

Use `http://localhost:8877` as the URL.

The developer can set an `ACC_SERVER_URL` environment variable to avoid having to provide the same `--server-url` flag for every command. Run `export ACC_SERVER_URL=<URL>` for the terminal session in use. If the developer explicitly specifies the `--server-url` flag, it overrides the `ACC_SERVER_URL` environment variable if it is set.

Installation

The Application Accelerator CLI commands are part of the Tanzu CLI Accelerator Plug-in. This is shipped as part of VMware Tanzu Application Platform and can be installed alongside other Tanzu CLI plug-ins shipped with the platform. For information about installing the Tanzu CLI and bundled plug-ins, see the Tanzu Application Platform documentation.

Commands

To view a list of commands, a description of commands, and help information, run:

```
tanzu accelerator  --help
```

Accelerator commands

Manage accelerators in a Kubernetes cluster.

Use: `tanzu accelerator [command]`

Where: `[command]` is a compatible command.

Aliases:
accelerator
acc

Available Commands:

Command	Description
apply	Apply accelerator
create	Create a new accelerator
delete	Delete an accelerator
generate	Generate project from accelerator
get	Get accelerator info
list	List accelerators

Command	Description
push	Push local path to source image
update	Update an accelerator

Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
-h, --help	Help for accelerator
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Use **`tanzu accelerator [command] --help`** for more information about a command.

Apply

Create or update accelerator resource by using the specified accelerator manifest file.

Use: **`tanzu accelerator apply [flags]`**

Where: **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator apply --filename <path-to-accelerator-manifest>
```

Flags:

Flag	Description
-f, --filename string	path of manifest file for the accelerator
-h, --help	help for apply
-n, --namespace string	namespace for accelerators; default is "accelerator-system"

Global Flags:

Flag	Description
--context name	name of the kubeconfig context to use; default is current-context defined by kubeconfig
--kubeconfig file	kubeconfig file; default is $HOME/.kube/config

Create

Create a new accelerator resource with specified configuration.

Accelerator configuration options include:

- Git repository URL and branch/tag where accelerator code and metadata is defined.
- Metadata description, display-name, tags, and icon-url.

The Git repository option is required. Metadata options are optional and override any values for the same options specified in the accelerator metadata retrieved from the Git repository.

Use: **`tanzu accelerator create [flags]`**

Where **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator create <accelerator-name> --git-repository <URL> --git-branch <branch>
```

Flags:

Flag	Description
--description string	Description of this accelerator
--display-name string	Display name for the accelerator
--git-branch string	Git repository branch to be used
--git-repository string	Git repository URL for the accelerator
--git-tag string	Git repository tag to be used
--git-branch string	Git repository branch to be used
-h, --help	Help for create
--icon-url string	URL for icon to use with the accelerator
--interval string	Interval for checking for updates to Git or image repository
--local-path string	Path to the directory containing the source for the accelerator
-n, --namespace name	Namespace for accelerators (default "accelerator-system")
--secret-ref string	Name of secret containing credentials for private Git or image repository
--source-image string	Name of the source image for the accelerator
--tags strings	Tags that can be used to search for accelerators

Global Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Delete

Delete the accelerator resource with the specified name.

Use: **`tanzu accelerator delete [flags]`**

Where **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator delete <accelerator-name>
```

Flags:

Flag	Description
-h, --help	Help for delete
-n, --namespace name	Namespace for accelerators (default "accelerator-system")

Global Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Generate

Generate a project from an accelerator using provided options and download project artifacts as a ZIP file.

Generation options are provided as a JSON string and must match the metadata options specified for the accelerator used for the generation. The options can include "projectName", which defaults to the name of the accelerator. This "projectName" is used as the name of the generated ZIP file.

You can see the available options by using the "tanzu accelerator list " command.

Here is an example of an options JSON string that specifies the "projectName" and an "includeKubernetes" Boolean flag:

```
--options '{"projectName":"test", "includeKubernetes": true}'
```

You can also provide a file that specifies the JSON string using the **`--options-file`** flag.

The generate command needs access to the Application Accelerator server. You can specify the **`--server-url`** flag or set an **`ACC_SERVER_URL`** environment variable. If you specify the **`--server-url`** flag, it overrides the **`ACC_SERVER_URL`** environment variable if it is set.

Use: **`tanzu accelerator generate [flags]`**

Where **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator generate <accelerator-name> --options '{"projectName":"test"}'
```

Flags:

Flag	Description
-h, --help	Help for generate
--options string	Options JSON string
--options-file string	Path to file containing options JSON string
--output-dir string	Directory that the zip file is written to
--server-url string	The URL for the Application Accelerator server

Global Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Get

Get accelerator information.

You can choose to get the accelerator from the Application Accelerator server by using the **`--server-url`** flag or from a Kubernetes context by using the **`--from-context`** flag. The default is to get accelerators from the Kubernetes context. To override this, you can set the **`ACC_SERVER_URL`** environment variable with the URL for the Application Accelerator server you want to access.

Use: **`tanzu accelerator get [flags]`**

Where: **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator get <accelerator-name> --from-context
```

Flags:

Flag	Description
--from-context	Retrieve resources from current context defined in kubeconfig
-h, --help	Help for get
-n, --namespace name	Namespace for accelerators (default "accelerator-system")
--server-url string	The URL for the Application Accelerator server

Global Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

List

List all accelerators.

You can choose to list the accelerators from the Application Accelerator server using **`--server-url`** flag or from a Kubernetes context using **`--from-context`** flag. The default is to get accelerators from the Kubernetes context. To override this, you can set the **`ACC_SERVER_URL`** environment variable with the URL for the Application Acceleratior server you want to access.

Use: **`tanzu accelerator list [flags]`**

Where: **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator list
```

Flags:

Flag	Description
--from-context	Retrieve resources from current context defined in kubeconfig
-h, --help	Help for list
-n, --namespace name	Namespace for accelerators (default "accelerator-system")
--server-url string	The URL for the Application Accelerator server

Global Flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Update

Update an accelerator resource with the specified name using the specified configuration.

Accelerator configuration options include:

- Git repository URL and branch/tag where accelerator code and metadata is defined.
- Metadata description, display-name, tags, and icon-url.

The update command also provides a **`--reconcile`** flag that forces the accelerator to be refreshed with any changes made to the associated Git repository.

Use: **`tanzu accelerator update [flags]`**

Where: **`[flags]`** is one or more compatible flags.

Examples:

```
tanzu accelerator update <accelerator-name> --description "Lorem Ipsum"
```

Flags:

Flag	Description
--description string	Description of this accelerator
--display-name string	Display name for the accelerator
--git-branch string	Git repository branch to be used
--git-repository string	Git repository URL for the accelerator
--git-tag string	Git repository tag to be used
-h, --help	Help for update
--icon-url string	URL for icon to use with the accelerator
--interval string	Interval for checking for updates to Git or image repository
-n, --namespace name	Namespace for accelerators (default "accelerator-system")
--reconcile	Trigger a reconciliation including the associated GitRepository resource
--secret-ref string	Name of secret containing credentials for private Git or image repository
--source-image string	Name of the source image for the accelerator
--tags strings	Tags used to search for accelerators

Global flags:

Flag	Description
--context name	Name of the kubeconfig context to use (default is current-context defined by kubeconfig)
--kubeconfig file	kubeconfig file (default is $HOME/.kube/config)

Troubleshooting Application Accelerator for VMware Tanzu 7

This topic has troubleshooting steps for:

- Development issues
- Accelerator authorship issues
- Operations issues

This chapter includes the following topics:

Development issues

Failure to generate a new project

`URI is not absolute` error

The `generate` command fails with the following error:

```
% tanzu accelerator generate test --server-url https://accelerator.example.com
Error: there was an error generating the accelerator, the server response was: "URI is not
absolute"

Use:
  tanzu accelerator generate [flags]

Examples:
  tanzu accelerator generate <accelerator-name> --options '{"projectName":"test"}'

Flags:
  -h, --help                  help for generate
      --options string        options JSON string
      --options-file string   path to file containing options JSON string
      --output-dir string     directory that the zip file will be written to
      --server-url string     the URL for the Application Accelerator server

Global Flags:
      --context name      name of the kubeconfig context to use (default is current-context
```

```
defined by kubeconfig)
      --kubeconfig file   kubeconfig file (default is $HOME/.kube/config)

there was an error generating the accelerator, the server response was: "URI is not absolute"

Error: exit status 1

✖  exit status 1
```

This indicates that the accelerator resource requested is not in a **`READY`** state. Review the instructions in the When Accelerator ready column is false section or contact your system admin.

Accelerator authorship issues

General tips

Speed up the reconciliation of the accelerator

Set the **`git.interval`** to make the accelerator reconcile sooner. The default interval is 10 minutes, which is too long when developing an accelerator.

You can set this when using the YAML manifest:

```
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  name: test-accelerator
spec:
  git:
    url: https://github.com/trisberg/test-accelerator
    ref:
      branch: main
    interval: 10s
```

You can also set this when creating the accelerator resource. To do so from the Tanzu CLI, run:

```
tanzu accelerator create test-accelerator --git-repo https://github.com/trisberg/test-
accelerator --git-branch main --interval 10s
```

Use a source image with local accelerator source directory

You don't have to use a Git repository when developing an accelerator. You can create an accelerator based on content in a local directory using **`--local-path`** when creating the accelerator resource.

Push the local path content to an OCI image by running:

```
tanzu accelerator create test-accelerator --local-path . --source-image REPO-PREFIX/test-
accelerator --interval 10s
```

Where **`REPO-PREFIX`** is your own repository prefix. Use a repository that the deployed Application Accelerator system can access.

The interval is 10s so that you can push changes to the source-image repository and get faster reconcile time for the accelerator resource. When you have made changes to your accelerator source, push those changes by running:

```
tanzu accelerator push --local-path . --source-image REPO-PREFIX/test-accelerator
```

Where **`REPO-PREFIX`** is your own repository prefix. Use a repository that is accessible to the deployed Application Accelerator system.

Expression evaluation errors

Expression evaluation errors include:

- Expression **`evaluated to null`**, such as:

  ```
  Could not read response from accelerator: java.lang.IllegalArgumentException: Expression
  '#mytestexp' evaluated to null
  ```

  In most cases, a typo in the variable name causes this error. Compare the expression with the defined options or any variables declared with **`let`**.

- **`could not parse SpEL expression`**, such as:

  ```
  Could not read response from accelerator: Error reading manifest:could not
  parse SpEL expression at [Source: (InputStreamReader); line: 65, column: 1]
  (through reference chain: com.vmware.tanzu.accelerator.engine.manifest.Manifest["engine"]-
  >com.vmware.tanzu.accelerator.engine.transform.transforms.Combo["let"]-
  >java.util.ArrayList[0]-
  >com.vmware.tanzu.accelerator.engine.transform.transforms.Let$DerivedSymbol["expression"])
  ```

  In most cases, an error in a **`let`** expression causes this error. Review the error message and, for more information, see SpEL samples.

- **`SpelEvaluationException`**, such as:

  ```
  Could not read response from accelerator:
  org.springframework.expression.spel.SpelEvaluationException: EL1007E: Property or field
  'test' cannot be found on null
  ```

  In most cases, an error in a transform expression causes this error. Review the error message and, for more information, see SpEL samples.

Operations issues

Check status of accelerator resources

Verify the status of accelerator resources by using kubectl or the Tanzu CLI:

- From kubectl, run:

  ```
  kubectl get accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
  ```

- From the Tanzu CLI, run:

```
tanzu accelerator list
```

Verify that the **READY** status is **true** for all accelerators.

When Accelerator ready column is blank

1 View the status of **accelerator-system**. For example:

```
$ kubectl get deployment -n accelerator-system
NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
acc-engine                      1/1     1            1           3d5h
acc-server                      1/1     1            1           2d1h
accelerator-controller-manager  0/1     1            0           3d5h
```

2 View the logs for any component with no Pods available by running:

```
$ kubectl logs deployment/accelerator-controller-manager/ -n accelerator-system -p
```

- If the log has the following error then the FluxCD source-controller is not installed:

```
2021-11-18T20:55:18.963Z ERROR setup problem running manager {"error": "failed to wait
for accelerator caches to sync: no matches for kind \"GitRepository\" in version
\"source.toolkit.fluxcd.io/v1beta1\""}
```

- If the log has the following error, the Tanzu Application Platform source-controller is not installed:

```
2021-11-18T20:50:10.557Z ERROR setup problem running manager {"error": "failed to wait
for accelerator caches to sync: no matches for kind \"ImageRepository\" in version
\"source.apps.tanzu.vmware.com/v1alpha1\""}
```

When Accelerator ready column is false

View the **REASON** column for non-ready accelerators. Run:

```
kubectl get accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
```

REASON: `GitRepositoryResolutionFailed`

1 View the resource status. Run:

```
$ kubectl get -oyaml accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
hello-fun
```

2 Read **status.conditions.message** near the end of the output to learn the likely cause of failure. For example:

```
status:
  address:
```

```
    url: http://accelerator-engine.accelerator-system.svc.cluster.local/invocations
  artifact:
    message: 'unable to clone ''https://github.com/sample-accelerators/hello-fun'',
      error: couldn''t find remote ref "refs/heads/test"'
    ready: false
    url: ""
  conditions:
  - lastTransitionTime: "2021-11-18T21:05:47Z"
    message: |-
      failed to resolve GitRepository
      unable to clone 'https://github.com/sample-accelerators/hello-fun', error: couldn't
find remote ref "refs/heads/test"
    reason: GitRepositoryResolutionFailed
    status: "False"
    type: Ready
  description: Test-git
  observedGeneration: 1
```

In this example, **`couldn't find remote ref "refs/heads/test"`** reveals that the branch or tag specified doesn't exist. Another common problem is that the Git repository doesn't exist. For example:

```
status:
  address:
    url: http://accelerator-engine.accelerator-system.svc.cluster.local/invocations
  artifact:
    message: 'unable to clone ''https://github.com/sample-accelerators/hello-funk'',
      error: authentication required'
    ready: false
    url: ""
  conditions:
  - lastTransitionTime: "2021-11-18T21:09:52Z"
    message: |-
      failed to resolve GitRepository
      unable to clone 'https://github.com/sample-accelerators/hello-funk', error:
authentication required
    reason: GitRepositoryResolutionFailed
    status: "False"
    type: Ready
  description: Test-git
  observedGeneration: 1
```

An error message about failed authentication might display because the Git repository doesn't exist. For example:

```
unable to clone 'https://github.com/sample-accelerators/hello-funk', error: authentication
required
```

REASON: `GitRepositoryResolutionPending`

1 See the resource status. Run:

```
$ kubectl get -oyaml accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
hello-fun
```

2 Locate `status.conditions` at the end of the output. For example:

```
status:
  address:
    url: http://accelerator-engine.accelerator-system.svc.cluster.local/invocations
  artifact:
    message: ""
    ready: false
    url: ""
  conditions:
  - lastTransitionTime: "2021-11-18T20:17:38Z"
    message: GitRepository not yet resolved
    reason: GitRepositoryResolutionPending
    status: "False"
    type: Ready
  description: Test-git
  observedGeneration: 1
```

3 Verify that the Flux system is running and that the `READY` column has `1/1`. For example:

```
$ kubectl get -n flux-system deployment/source-controller
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
source-controller   1/1     0            0           5d4h
```

####n REASON: `ImageRepositoryResolutionPending`

```
$ kubectl get accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
NAME        READY   REASON                            AGE
more-fun    False   ImageRepositoryResolutionPending   28s
```

1 See the resource status. Run:

```
$ kubectl get -oyaml accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
hello-fun
```

2 Locate `status.conditions` at the end of the output. For example:

```
$ kubectl get -oyaml accelerators.accelerator.apps.tanzu.vmware.com -n accelerator-system
more-fun
apiVersion: accelerator.apps.tanzu.vmware.com/v1alpha1
kind: Accelerator
metadata:
  annotations:
    kubectl.kubernetes.io/last-applied-configuration: |

{"apiVersion":"accelerator.apps.tanzu.vmware.com/v1alpha1","kind":"Accelerator","metadata":
{"annotations":{},"name":"more-fun","namespace":"accelerator-system"},"spec":
```

```
{"description":"Test-image","source":{"image":"trisberg/more-fun-source"}}}
  creationTimestamp: "2021-11-18T20:32:36Z"
  generation: 1
  name: more-fun
  namespace: accelerator-system
  resourceVersion: "605401"
  uid: 407b565d-14aa-44fe-ad8d-c9b3c3a7e5ce
spec:
  description: Test-image
  source:
    image: trisberg/more-fun-source
status:
  address:
    url: http://accelerator-engine.accelerator-system.svc.cluster.local/invocations
  artifact:
    message: ""
    ready: false
    url: ""
  conditions:
  - lastTransitionTime: "2021-11-18T20:32:36Z"
    message: ImageRepository not yet resolved
    reason: ImageRepositoryResolutionPending
    status: "False"
    type: Ready
  description: Test-image
  observedGeneration: 1
```

3 Verify that Tanzu Application Platform source-controller system is running and the **READY** column has **1/1**. For example:

```
$ kubectl get -n source-system deployment/source-controller-manager
NAME                        READY   UP-TO-DATE   AVAILABLE   AGE
source-controller-manager   1/1     0            0           5d5h
```